Concl'd B5

20 assembling the two wafers together such that the plurality of aligned respective channels accommodate the plurality of aligned respective waveguides.--

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--41. (Amended) The method in accordance with claim 33, wherein said assembling procedure includes filling the channels of the substrate while accommodating the waveguides.--

REMARKS

The Office Action in the prior case presents what are indicated as being new ground(s) of rejection. Applicant respectfully requests consideration and entry of the present preliminary amendment responsive to the Office Action in the prior application. These amendments are respectfully believed to place the application into condition for allowance.

Claims 1-11, 15-25 and 27-41 are rejected under 35 U.S.C. §103(a) from Bunin et al. U.S. Patent No. 5,907,651 in view of Yanagawa et al. U.S. Patent No. 5,297,228. In addition, claims 12 and 26 are rejected under 35 U.S.C. §103(a) from Bunin in view of Yanagawa and further in view of Ota et al. U.S. Patent No. 5,656,120.

Each of the independent claims (claims 1, 21 and 33) is amended to specify that the substrate module includes a first wafer having a plurality of waveguides positioned thereon prior to its assembly with a second wafer which opposes the first wafer and that accommodates the plurality of first wafer waveguides after the wafers are assembled together. This feature was found in original claims 17, 30 and 40 (verbatim in the case of claim 40 and in a somewhat different form in the case of claims 17 and 30). Each of these three former dependent claims is accordingly canceled. This general subject matter also is treated by claims 16 and 29, which are presently amended in order to be consistent with the revisions to claims 1 and 21, respectively.

By the present amendments, applicant first responds directly to the §103(a) rejection claims 16-20, 29-32 and 40-41, which was articulated in the Office Action beginning on page 5. That rejection acknowledges that Bunin does not teach a substrate module that is made of

two wafers of the type recited in these claims. The Office takes the position that Yanagawa teaches two wafers, suggesting that the Yanagawa teaching in this regard renders applicant's invention of these claims obvious when combined with Bunin. In addition to the reasons noted elsewhere herein that combining Bunin with Yanagawa is deficient, applicant respectfully observes that Yanagawa does not teach the multiple wafer feature which is now included in all of the independent claims.

The Office refers to Fig. 2 of Yanagawa as showing a plurality of waveguides. Applicant acknowledges that Fig. 2 shows waveguides 4. The Office further refers to a plurality of "corresponding" channels in Fig. 1. Applicant understands these channels to be the marker grooves 2, which are the only channels shown in Fig. 1. Applicant is not certain what is meant by the term "corresponding" in this rejection. Applicant does respectfully observe that the marker grooves 2 do not accommodate the waveguides 4. This is abundantly clear from Fig. 2, for example. It is understood that the marker grooves 2 and the waveguides 4 are intended to be precisely parallel according to the teachings of Yanagawa. Since these parallel marker grooves 2 and waveguides 4 are spaced apart from each other along their respective entire lengths, grooves 2 do not accommodate waveguides 4.

The present Office Action suggests it would have been obvious to combine Yanagawa (and Ota in the case of claims 12 and 26) to arrive at applicant's various claim combinations. The Office points to reasons such as: being "motivated by a high-reliability connection that can be carried out in a short time", "permits ease of connection", and "significantly reduces optical loss", each based on certain passages in Yanagawa. Similar rational is given to the effect that one would be motivated to use a filler to hold and fix waveguides and to optimize coupling using input and output ends having a different number of waveguide ends.

While applicant acknowledges that each of these statements can be found in Yanagawa, these statements do not appreciate the important divergence between the teachings of Bunin and Yanagawa. If one of ordinary skill in the art had attempted to modify Bunin in accordance with the teachings of Yanagawa without applicant's guidance, that party would

have to proceed directly against the teachings of Yanagawa, as discussed in more detail hereinafter.

First, applicant notes his disagreement with the suggestion by the Office on page 3 that Bunin discloses a passive alignment fiber optic connection system, which is of course the type of system claimed by applicant. Bunin provides very specific teachings for making a ferrule using a particular fixture. Bunin does discuss prior art and the tedium of laying fibers into single aligning passages. All this provides for an easier approach for making ferrules that have fibers that are themselves well aligned. However, there is no teaching of alignment between this ferrule and a substrate module. Bunin merely mentions that one could put two ferrules together or combine a ferrule with an "appropriate complementary connecting device". See column 2, lines 6-7 and lines 44-45. Lines 43-44 of column 3 also mention that "the ferrule then is assembled in an overall fiber optic connector assembly." There is no teaching concerning any such complementary connecting device. There is no teaching how such a device is to be passively aligned with the Bunin ferrule.

Bunin's advance in the art is to modify the connector ferrule so that it has an elongated fiber passage 54 adequate to accommodate an entire multi-fiber cable. This avoids the need for a single passage for each individual fiber and for the tedious task of laying individual fibers into individual grooves of the ferrule. This whole approach of Bunin is made possible by the fixture of Bunin including the fixed alignment block 82 with a chamfered trough 90 with grooves 92 to precisely align the fibers 22 within the elongated fiber passage 54 of the Bunin ferrule. This fixture approach does not form a substrate module as claimed by applicant.

Applicant also respectfully refers to lines 40-42 in column 7 of Bunin. This passage specifically shows that Bunin uses its fixture having precision alignment in order to transfer the fixture's precision alignment to the ferrule being made according to Bunin.

Accordingly, Bunin teaches technology useful for making ferrules but does not even remotely suggest that technology of this type would be used for other components in an

overall fiber optic connector assembly, particularly one enjoying passive alignment characteristics.

Returning to Yanagawa, the ferrule-type component of Yanagawa must, according to the teachings of Yanagawa, be made by the approach taught by Yanagawa. That approach is totally divergent from the fixture approach of Bunin. The primary point of Bunin is to avoid laying individual fibers into individual grooves. However, this is exactly the teaching of Yanagawa in its approach to provide a passive connection of an optical fiber to an optical waveguide. Contrary to the precise alignment fixture approach of Bunin, Yanagawa teaches the components must all be made from the same chip. This chip then is severed into a central chip B_2 and into end chips B_1 and B_3. The end chips are in the position of a ferrule in accordance with the combination presented by the Office.

It accordingly would not have been obvious for one of ordinary skill in the art to combine these diverse teachings of Bunin and Yanagawa. Furthermore, as noted previously, even if this combination would have been obvious to one of ordinary skill in the art, the substrate module as claimed would not be taught. Yanagawa falls far short of doing so.

The Ota reference shows its optical waveguide element 4 in phantom and has no teachings that would remove the deficiencies of Yanagawa with respect to the substrate module claimed by applicant.

Reconsideration and withdrawal of the §103(a) rejection are respectfully requested. This application is believed to be in condition for allowance upon entry of the presently amended claims.

Respectfully submitted,

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Date: 5-22-03

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Version of Amended Claims Showing the Changes Made

In the Claims:

--1. (Twice Amended) A passive alignment fiber optic connection system, comprising:

a connector module having a plurality of fiber optic fibers having ends terminating at a face of said connector module;

a substrate module having a plurality of waveguides having ends terminating at a first face or at a second face of said substrate module to define an input end and an output end which are different from each other;

at least two pins projecting from one of said modules at pin locations;

at least two pin passages within another of said modules at pin locations and through said face thereof, respective said pin passages being sized, shaped and positioned to receive respective said projecting pins; [and]

said ends of said fiber optic fibers are spaced from one another and from said pin locations of the connector module in accordance with a predetermined alignment pattern, and said ends of said waveguides are spaced from one another and from said pin locations of the substrate module in accordance with said predetermined alignment pattern, whereby each of said respective waveguides optically aligns with each of said respective fibers when said modules are attached together; and

said substrate module includes at least two wafers assembled together, and prior to assembly a first said wafer has said plurality of waveguides positioned thereon, and after assembly a second said wafer opposes said first wafer and accommodates said plurality of waveguides positioned on said first wafer.--

--16. (Amended) The fiber optic connection system in accordance with claim 1, wherein [said substrate includes two wafers assembled together, and prior to assembly one said wafer has said plurality of waveguides while the other] said second wafer has a plurality

of channels which accommodate said plurality of waveguides when the wafers are assembled together.--

--21. (Twice Amended) A passive alignment fiber optic substrate module, comprising:

a substrate body having a first face and a second face;

a plurality of waveguides which are within said substrate body and which have first ends terminating at said first face and second ends terminating at said second face of the substrate module to define an input end and an output end which are different from each other;

a pin location at said first face, and a pin location at said second face; [and]

said first ends of said waveguides are spaced from one another and from one said pin location and said second ends are spaced from one another and from another said pin location of the substrate module in accordance with respective predetermined alignment patterns which are adapted to coincide with fiber optic fibers and pin locations of another component; and

said substrate body includes at least two wafers assembled together, and prior to assembly a first said wafer has said plurality of waveguides positioned thereon, and after assembly a second said wafer opposes said first wafer and accommodates said plurality of waveguides positioned on said first wafer.--

--29. (Amended) The fiber optic substrate module in accordance with claim 21, wherein [said body includes two wafers assembled together, and prior to assembly one said wafer has said plurality of waveguides while the other] said second wafer has a plurality of channels which accommodate said plurality of waveguides when the wafers are assembled together.--

--33. (Twice Amended) A method for passive optical alignment of a fiber optic connection system, comprising the steps of:

providing a connector module having a plurality of fiber optic fibers having ends terminating at a face of the connector module and having at least two pin locations;

spacing said ends of the fiber optic fibers and said pin locations in accordance with a predetermined alignment pattern;

assembling, by an assembly procedure separate from said providing step, a substrate module having a plurality of waveguides having ends terminating at a face of the substrate module and having at least two pin locations;

spacing said ends of the waveguides from one another and from said pin locations of the substrate module in accordance with said predetermined alignment pattern; [and]

attaching the connector module and substrate module together in order to thereby automatically optically align each of the respective waveguides with each of the respective fibers when the modules are attached together; and

wherein said substrate module assembling procedure includes:

forming a wafer having a plurality of aligned respective channels;

forming another wafer having a plurality of aligned respective waveguides; and

assembling the two wafers together such that the plurality of aligned respective channels accommodate the plurality of aligned respective waveguides.--

--41. (Amended) The method in accordance with claim 33 [40], wherein said assembling procedure includes filling the channels of the substrate while accommodating the waveguides.—